

Status on the use of scatterometer winds in the HARMONIE model system at MET Norway

Teresa Valkonen

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What we know and don't know

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- Several weather centres improve the model initial state and forecasts with scatterometer data assimilation in global models
- Impact of scatterometer winds in the high-resolution limited area model HARMONIE hasn't been shown

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 ASCAT winds help to achieve more accurate initial state of the NWP model which would improve forecasting of mid-latitude cyclones and polar lows



ASCAT on board MetOp-A and MetOp-B satellites



Picture: EUMETSAT







- ASCAT on board MetOp-A and MetOp-B satellites
- Scatterometer wind retrieval leads to 2-4 different wind solutions
- The accuracy of ASCAT products is known to be characterised by a wind component RMSE <2 m/s and bias < 0.5 m/s</li>





Analysis



HARMONIE model system 38h1.2 – operational at MET Norway/SMHI at the moment



3D-Var assimilation of ambiguous ASCAT wind components





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Model system	<ul> <li>HARMONIE model system 38h1.2, which is operational at MET Norway/SMHI at the moment</li> <li>3D-Var assimilation of ambiguous ASCAT wind components, observation error 1.5 m/s</li> </ul>
Experiments	<ul> <li>~1-month impact experiment with «default» settings in the operational domain, 100 km thinning</li> <li>1-week thinning experiments: 50 km and 12.5 km thinning</li> <li>~1-month Arctic domain experiment</li> </ul>
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# Wind component departures from model background



# Wind component departures from model analysis



# Wind component departures from model background and analysis



#### Variables

- Mean sea level pressure (MSLP)
- 10-m wind speed

#### Measures

- Mean error (ME)
- Root-mean-squareerror (RMSE)



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Mean sea level pressure - errors by forecast length





Mean sea level pressure – errors by forecast length





70°N

65°N

60°N

55°N

10°E 15°E 20°E

55°N

Mean sea level pressure – errors of 12-h forecast as timeseries





10-m wind speed – errors by forecast length







10-m wind speed – errors by forecast length





10-m wind speed – errors of 12-h forecast as timeseries



10°E 20°E 30°E

65°N

55°N

70°N

65°N

60°N

55°N

5°E 10°E

15°E 20°E 25°E

# Average impact on forecasts in thinning experiments

#### 1-week thinning experiments







CONV+AMSU+ ASCAT 100 km thinning

#### CONV+AMSU+ ASCAT 50 km thinning

#### CONV+AMSU+ ASCAT 12.5 km

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# Average impact on forecasts in thinning experiments

1-week thinning experiments – errors by forecast length





# Average impact on forecasts in thinning experiments

1-week thinning experiments – errors by forecast length





10°E 20°E 30°E

55°N

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# Average impact on forecasts over land in the Arctic experiments





### Average impact on forecasts over land in the Arctic experiments





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09 March 2015 EUMETSAT Fellow Day

## Average impact on forecasts over land in the Arctic experiments







Satellite image and surface observations





MetCoOp REF - CONV+AMSU +12h





MetCoOp SCAT – CONV+AMSU+ASCAT +12h





Arctic REF – CONV+AMSU +12h





Arctic SCAT – CONV+AMSU+ASCAT +12h





Timeseries of 12-h forecast at Torsvåg station



#### **Hypothesis**

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#### What we know and don't know

- Impact of ASCAT is small but neutral-positive
- Reduced thinning distance seems to improve results
- We don't know yet how the assimilation works in operational setting (data streams, robustness etc.)
- Impact of shorter assimilation window and revisited background errors is not known

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#### - ASCAT winds help to achieve more accurate initial **Hypothesis** state of the NWP model which can improve forecasting of mid-latitude cyclones and polar lows - HARMONIE model experiments applying ASCAT-A **Fellowship** and ASCAT-B data in the data assimilation Project - Impact of ASCAT is small but neutral-positive - Reduced thinning distance seems to improve results - We don't know yet how the assimilation works in What we know operational setting (data streams, robustness etc.) and don't know - Impact of shorter assimilation window and revisited background errors is not known - When implemented into operations, improved Why this research forecasts can help to protect life and property is important?

## **Next steps**

Operational implementation

 Planing of implementing ASCAT data assimilation into operations has started in the framework of MetCoOp (MET Norway/SMHI)



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- More detailed analysis of the model results available
- Impact of shorter assimilation window
- Impact of background error covariances

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#### **Publication(s)**

- Start writing a peer-review journal article about «scatterometer data impact in a high-resolution limited area model»  $\sim$ 

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## Thank you!

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